CLAIMS

1. A viewing angle magnification liquid crystal display comprising at least:

a backlight system containing a polarization element (A) obtained by disposing a retardation layer (b) between at least two layers, included in a reflection polarizer (a), and having respective selective reflection wavelength bands of polarized light superimposed on each other to conduct collimation for a diffusion light source;

a liquid crystal cell transmitting collimated lights;

a polarizing plate disposed on both sides of the liquid crystal cell; and

a viewing angle magnifying layer disposed on the viewer side of the liquid crystal cell to diffuse transmitted light.

2. The viewing angle magnification liquid crystal display according to claim 1, wherein

the selective reflection wavelengths of the at least two layers of the reflection polarizer (a) are superimposed on each other in the wavelength range of 550 nm ± 10 nm.

3. The viewing angle magnification liquid crystal display according to claim 1 or 2, wherein

the reflection polarizer (a) is a circular polarization type

reflection polarizer (a1) transmitting circularly polarized light but selectively reflecting reverse circularly polarized light, and

the retardation layer (b) comprises a layer (b1) having a front retardation (in the normal direction) of almost zero and a retardation of λ/8 or more relative to incident light incoming at a direction inclined from the normal direction by 30° or more.

4. The viewing angle magnification liquid crystal display according to claim 1 or 2, wherein

the reflection polarizer (a) is a linear polarization type reflection polarizer (a2) transmitting one of linearly polarized lights perpendicular to each other, but selectively reflecting the other thereof,

the retardation layer (b) comprises a layer (b1) having a front retardation (in the normal direction) of almost zero and a retardation of λ/4 or more relative to incident light incoming at a direction inclined from the normal direction by 30° or more,

layers (b2) each having a front retardation of about λ/4 disposed on both sides of the layer (b1), one of the layers (b2) being disposed between the retardation layer (b1) and a corresponding linear polarization type reflection polarizer (a2) and the other of the layers (b2) being disposed between the retardation layer (b1) and another linear polarization type reflection polarizer (a2),

the layer (b2) on the incidence side is arranged at an angle of 45° (–45°) ± 5° relative to the polarization axis of the linear

polarization type reflection polarizer (a2) on the incidence side,

the layer (b2) on the emission side is arranged at an angle of –45° (+45°) ± 5° relative to the polarization axis of the linear polarization type reflection polarizer (a2) on the emission side, and

the layer (b2) on the incidence side and the layer (b2) on the emission side are arranged at an arbitrary angle formed between the respective slow axes thereof.

5. The viewing angle magnification liquid crystal display according to claim 1 or 2, wherein

the reflection polarizer (a) is a linear polarization type reflection polarizer (a2) transmitting one of linearly polarized lights perpendicular to each other, but selectively reflecting the other thereof,

the retardation layer (b) comprises two biaxial retardation layers (b3) each having a front retardation (in the normal direction) of about λ/4 and an Nz factor of 2 or more,

the slow axis direction of the layer (b3) on the incidence side is arranged at an angle of 45° (–45°) ± 5° relative to the polarization axis of the linear polarization type reflection polarizer (a2) on the incidence side,

the slow axis direction of the layer (b3) on the emission side is arranged at an angle of –45° (+45°) ± 5° relative to the polarization axis of the linear polarization type reflection polarizer (a2) on the emission side, and

the layer (b3) on the incidence side and the layer (b3) on the emission side are arranged at an arbitrary angle formed between the respective slow axes thereof.

6. The viewing angle magnification liquid crystal display according to claim 1 or 2, wherein

the reflection polarizer (a) is a linear polarization type reflection polarizers (a2) transmitting one of linearly polarized lights perpendicular to each other, but selectively reflecting the other thereof,

the retardation layer (b)comprises one biaxial retardation layer (b4) having a front retardation (in the normal direction) of about $\lambda/2$ and an Nz factor of 1.5 or more,

the slow axis direction of the layer on the incidence side is arranged at an angle of 45° (–45°) ± 5° relative to the polarization axis of the linear polarization type reflection polarizer (a2) on the incidence side,

the slow axis direction of the layer on the emission side is arranged at an angle of –45° (+45°) ± 5° relative to the polarization axis of the linear polarization type reflection polarizer (a2) on the emission side, and

the polarization axes of the two linear polarization type reflection polarizers (a2) are almost perpendicular to each other.

7. The viewing angle magnification liquid crystal display

according to any of claims 1 to 4, wherein

the retardation layer (b1) is of a cholesteric liquid crystal phase, having a selective reflection wavelength band in a region outside the visible light region, and fixed in a planar alignment state.

8. The viewing angle magnification liquid crystal display according to any of claims 1 to 4, wherein

the retardation layer (b1) is of a rod-like liquid crystal fixed in a homeotropic alignment state.

9. The viewing angle magnification liquid crystal display according to any of claims 1 to 4, wherein

the retardation layer (b1) is of a discotic liquid crystal fixed in an alignment state of a nematic phase or a columnar phase.

10. The viewing angle magnification liquid crystal display according to any of claims 1 to 4, wherein

the retardation layer (b1) is a biaxially aligned polymer film.

11. The viewing angle magnification liquid crystal display according to any of claims 1 to 4, wherein

the retardation layer (b1) is of an inorganic layered compound with a negative uniaxiality fixed in an alignment state so that the normal direction of a surface of the compound is an

optical axis.

12. The viewing angle magnification liquid crystal display according to any of claims 3 and 6 to 11, wherein

the circular polarization type reflection polarizer (a1) comprises a cholesteric liquid crystal.

13. The viewing angle magnification liquid crystal display according to any of claims 3 and 6 to 12, wherein

a $\lambda/4$ plate is disposed on the viewer side (the liquid crystal cell side) of the circular polarization type reflection polarizer (a1), and an axis direction of a linearly polarized light obtained by transmission and a transmission axis direction of a polarizing plate on the lower surface side (the light source side) of the liquid crystal display are disposed in alignment with each other.

14. The viewing angle magnification liquid crystal display according to any of claims 4 to 11, wherein

the linear polarization type reflection polarizer (a2) is a stretched resin laminate with multiple layers comprising resin materials having respective different refractive indexes and retardation.

15. The viewing angle magnification liquid crystal display according to any of claims 4 to 11 and 14, wherein

an axis direction of a linearly polarized light obtained by transmission of the linear polarization type reflection polarizer (a2) and a transmission axis direction of a polarizing plate on the lower surface side (the light source side) of the liquid crystal display are disposed in alignment with each other.

16. The viewing angle magnification liquid crystal display according to any of claims 1 to 15, wherein

the viewing angle magnifying layer is a diffusion plate having substantially neither backscattering nor polarization cancellation.

17. The viewing angle magnification liquid crystal display according to any of claims 1 to 16,

wherein each of layers is laminated using a transparent adhesive agent or pressure-sensitive adhesive agent.